

## Appendix S

### **S-1 South Dakota Field Office Air Resource Management Plan: *Adaptive Management Strategy for Oil and Gas Resources***

#### **Table of Contents**

1.0	Introduction .....	3
1.1	Purpose of the Air Management Plan .....	3
1.2	Revision of the Air Resource Management Plan .....	4
1.3	Current Air Quality .....	4
1.4	Background of the AQTW and the MOU Regarding Air Quality Analyses and Mitigation for Federal Oil and Gas Decisions through the NEPA Process .....	4
1.5	BLM's Role With Regard to Air Resources .....	4
2.0	Oil and Gas Activity Assessment .....	5
3.0	Ambient Air Quality Monitoring Support .....	5
4.0	Air Quality and AQRV Assessment .....	6
4.1	Annual NAAQS Assessment .....	6
4.2	Preliminary Ozone Assessment .....	7
4.3	Annual AQRV Assessment .....	7
5.0	Future Modeling .....	8
5.1	Photochemical Grid Modeling .....	8
5.1.1	Data Acquisition .....	8
5.1.2	PGM Schedule .....	8
5.1.3	SD DENR and AQTW Review and Input to PGM .....	9
5.1.4	Availability of PGM Results .....	9
5.2	Post-PGM Modeling .....	10
6.0	Mitigation .....	10
6.1	Initial Mitigation Actions .....	10
6.2	Monitoring-Based Mitigation .....	11
6.2.1	Monitoring-Based Thresholds before PGM Completion .....	11
6.2.2	Determination of Enhanced Mitigation Measures Before PGM Completion .....	12
6.2.3	Monitoring-Based Thresholds after PGM Completion .....	13
6.2.4	Determination of Enhanced Mitigation Measures After PGM Completion .....	13
6.3	Modeling-Based Mitigation .....	13
6.3.1	Modeling-Based Thresholds .....	13
6.3.2	Modeling-Based Enhanced Mitigation Measures .....	13
7.0	Bibliography .....	14

#### **List of Tables**

Table 1.	Representative Air Quality Monitoring Stations within the Planning Area .....	6
Table 2.	NAAQS for Pollutants Monitored in the Planning Area .....	6
Table 3.	Data Acquisition and PGM Schedule .....	9

## Acronyms

APD	Application for Permits to Drill
AQRV	Air quality related value
AQS	Air Quality System
AQTW	Air Quality Technical Workgroup
ARMP	Air Resource Management Plan
ARTSD	Air Resource Technical Support Document
BLM	Bureau of Land Management
CAMx	Comprehensive Air Quality Model with Extensions
CFR	Code of Federal Regulations
CO	Carbon monoxide
FLIR	Forward looking infrared
FLPMA	Federal Land Policy and Management Act
hp	Horsepower
$\mu\text{g}/\text{m}^3$	Micrograms per cubic meter
MOU	Memorandum of Understanding
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NO	Nitric oxide
NO <sub>2</sub>	Nitrogen dioxide
NO <sub>x</sub>	Nitrogen oxides
NPS	National Park Service
O <sub>3</sub>	Ozone
Pb	Lead
PGM	Photochemical grid modeling
PM <sub>10</sub>	Particulate matter with a diameter less than or equal to 10 microns
PM <sub>2.5</sub>	Particulate matter with a diameter less than or equal to 2.5 microns
POD	Plan of Development
ppb	Parts per billion
ppm	Parts per million
REC	Reduced emissions completion
ROD	Record of Decision
RMP	Resource Management Plan
SDAAQS	South Dakota Ambient Air Quality Standards
SD DENR	South Dakota Department of Environment & Natural Resources
SLAMS	State or Local Air Monitoring Station
SO <sub>2</sub>	Sulfur dioxide
tpy	Tons per year
USDI	U.S. Department of Interior
USEPA	U.S. Environmental Protection Agency
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
VOC	Volatile organic compound
WRAP	Western Regional Air Partnership
WRF	Weather and Research Forecasting

## 1.0 Introduction

### 1.1 Purpose of the Air Resource Management Plan

The Bureau of Land Management (BLM) South Dakota Field Office (SDFO) Air Resource Management Plan (ARMP) for oil and gas activities describes the air quality adaptive management strategy that would be used to assess future air quality and Air Quality Related Values (AQRVs) and identify mitigation measures to address unacceptable impacts that could potentially be associated with future oil and gas development. The adaptive management strategy focuses on oil and gas activity because aggregated emissions from multiple small sources at well sites can potentially cause significant air quality and AQRV impacts under certain circumstances. Many of these small oil and gas emission sources are not required to obtain air quality permits from the South Dakota Department of Environment & Natural Resources (SD DENR).

The oil and gas adaptive management strategy was prepared in collaboration with or with the review of the U.S. Environmental Protection Agency (USEPA) and three federal land management agencies under the Understanding Among the U.S. Department of Agriculture, U.S. Department of the Interior, and U.S. Environmental Protection Agency, Regarding Air Quality Analyses and Mitigation for Federal Oil and Gas Decisions Through the National Environmental Policy Act [NEPA] Process (USDI 2011). This agreement is described in more detail in Section 1.4. Although not a signatory to the MOU, the SD DENR participates in the Air Quality Technical Workgroup (AQTW) that was established to implement the MOU process for the Proposed Resource Management Plan (PRMP) and Environmental Impact Statement (EIS). The ARMP provides a means for the BLM to satisfy its statutory responsibility under NEPA and the Federal Land Policy and Management Act (FLPMA) to protect air quality and other natural resources. Under the ARMP, the BLM will take appropriate management action if monitoring data for local areas with BLM-authorized oil and gas activity indicate that additional emission reductions may be needed to maintain good air quality. Due to the fragmentation of surface and mineral estate within the planning area, the BLM would work with the SD DENR to identify a consistent emission control approach throughout an area of concern.

The ARMP includes both near-term actions and long-term actions. In the near-term, the ARMP sets forth initial actions to maintain good air quality until regional modeling can be performed to further assess potential impacts to air quality and AQRVs. In the long-term, the ARMP provides ongoing management strategies to assess and adapt to new air quality and AQRV ambient monitoring and modeling data during the life of this Resource Management Plan (RMP).

The ARMP includes a multifaceted approach involving the following activities.

- Oil and gas activity assessment
- Ambient air quality monitoring support
- Air quality and AQRV assessment
- Future air quality and AQRV modeling
- Mitigation

Pollutant emissions addressed by the ARMP include the criteria air pollutants listed below.

- Carbon monoxide (CO)
- Nitrogen dioxide (NO<sub>2</sub>)
- Ozone (O<sub>3</sub>)
- Particulate matter with a diameter less than or equal to 10 microns (PM<sub>10</sub>)
- Particulate matter with a diameter less than or equal to 2.5 microns (PM<sub>2.5</sub>)
- Sulfur dioxide (SO<sub>2</sub>)

Two criteria air pollutants, CO and lead, are not monitored within the planning area because high concentrations of these pollutants are unlikely. Elevated concentrations of CO are associated with vehicle traffic in very large urban areas, while high concentrations of lead are typically found near industrial facilities that emit large quantities of lead compounds. These situations do not occur in the planning area, as described in Chapter 3 of the Draft RMP. CO emissions would be modeled to demonstrate compliance with the NAAQS. Due to the lack of lead emissions from oil and gas activities, lead emissions would not be modeled as part of the air quality analysis.

The ARMP also addresses modeling and mitigation for the following AQRV assessments.

- Deposition of sulfur and nitrogen
- Lake acid neutralizing capacity
- Visibility

The adaptive management strategy for oil and gas resources provides the flexibility to respond to changing conditions that could not be predicted during RMP development. This strategy also allows for the use of new technology and methods that may minimize or reduce impacts.

## **1.2 Revision of the Air Resource Management Plan**

This ARMP may be modified as necessary to comply with law, regulation, and policy and to address new information and changing circumstances. Changes to the goals or objectives set forth in the SDFO RMP/EIS would require maintenance or amendment of the RMP while changes to implementation, including modifying this ARMP, may be made without amending the RMP.

## **1.3 Current Air Quality**

Areas within the planning area are designated as areas that attain the National Ambient Air Quality Standards (NAAQS) and state-based standards known as the South Dakota Ambient Air Quality Standards (SDAAQS), which are identical to the NAAQS. Throughout this document references to the NAAQS will also be understood to include the SDAAQS.

## **1.4 Background of the AQTW and the MOU Regarding Air Quality Analyses and Mitigation for Federal Oil and Gas Decisions through the NEPA Process**

The Air Quality Technical Workgroup (AQTW) includes representatives from the following agencies: the BLM, USEPA, U.S. Forest Service (USFS), U.S. Fish and Wildlife Service (USFWS), and the National Park Service (NPS). Each of these agencies is a party to the *Memorandum of Understanding Among the U.S. Department of Agriculture, U.S. Department of the Interior, and U.S. Environmental Protection Agency, Regarding Air Quality Analyses and Mitigation for Federal Oil and Gas Decisions Through the National Environmental Policy Act Process* (USDI 2011) (herein referred to as the MOU). This agreement is designed to “. . . facilitate the completion of NEPA environmental analyses for Federal land use planning and oil and gas development decisions [USDI 2011].”

The MOU sets forth collaborative procedures that the AQTW agencies use to analyze potential air quality and AQRV impacts. The agencies also work together to identify potential mitigation measures that may be needed to reduce impacts to air quality and AQRVs. The lead agency (the BLM in this case), in collaboration with the other agencies, has the responsibility to identify reasonable mitigation and control measures to address adverse impacts to air quality. Mitigation measures may also address impacts to AQRVs at Class I areas and at sensitive Class II areas that have been identified by the BLM, USFS, USFWS, and NPS.

The AQTW provided input to this ARMP and will continue to work collaboratively on future modeling efforts associated with this RMP. Provisions of the MOU continue to apply to future oil and gas activities in the planning area. In some cases, air quality and AQRV modeling performed under this ARMP may be sufficient to address modeling needs for future oil and gas projects that would otherwise require additional modeling under the MOU. However, the ARMP in no way replaces provisions of the MOU. Determinations of existing modeling adequacy for future oil and gas activities that trigger the MOU would be made collaboratively by the AQTW using the procedures included in the MOU.

The SD DENR has the primary authority to protect air quality within the state. Although the SD DENR is not a signatory to the national MOU, successful air quality management of BLM-authorized oil and gas activities depends on a close working relationship between the BLM and the SD DENR. The two agencies have worked together to improve air quality monitoring and will continue to cooperate by sharing data, planning modeling efforts, and working together to identify emission reduction measures needed to maintain good air quality.

## **1.5 BLM's Role With Regard to Air Resources**

Primary air quality management authority and responsibility for the planning area rest with the SD DENR (for non-tribal areas of the planning area) and the USEPA for tribal areas. The BLM's authority to address air resources derives primarily from FLPMA and NEPA. Under FLPMA, the BLM must “provide for compliance with applicable pollution control laws, including State and Federal air, water, noise, or other pollution standards or implementation

plans” in the development and revision of land use plans (Section 202 (c)(8)). FLPMA also authorizes the BLM to manage public lands “in a manner that will protect the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archeological values” (Section 102 (8)).

Under NEPA, the BLM ensures that information on potential environmental and human impacts of Federal actions is available to public officials and citizens before decisions are made and before actions are taken. One of the purposes of the Act is to “promote efforts which will prevent or eliminate damage to the environment and biosphere,” and to promote human health and welfare (Section 2). NEPA requires that BLM and other federal agencies prepare a detailed statement on the environmental impact of the proposed action for major Federal actions expected to significantly affect the quality of the human environment (Section 102 (C)).

The BLM’s authority under the Clean Air Act primarily derives from the requirement that BLM-authorized activities comply with the Clean Air Act. BLM-authorized activities may not violate the Clean Air Act or federal and state regulations and State Implementation Plans issued to implement the Act. When air quality or AQRV modeling performed during NEPA analysis predicts potential violations of the Clean Air Act or unacceptable AQRV impacts, the BLM evaluates the data and determines whether mitigation measures are needed. For example, the initial mitigation measure requiring drill rig engines to meet Tier 4 emission standards reduces NO<sub>2</sub> emissions and was demonstrated via modeling to prevent NAAQS violations from multiple large drill rig engines that may operate on one well pad. The mitigation measure includes an exception that allows use of drill rig engines meeting Tier 1, 2, or 3 emission standards if future modeling or near-field monitoring demonstrates compliance with the NAAQS.

When determining whether mitigation measures are needed, the BLM reviews current and proposed federal, state, and local regulations to determine whether mitigation will occur due to other agency actions. If the BLM determines that additional mitigation is needed while implementing this ARMP, the BLM will work closely with the SD DENR to coordinate future mitigation measures for BLM-authorized activities.

## **2.0 Oil and Gas Activity Assessment**

Each year, the BLM would track the number and locations of new oil and gas wells drilled on federal mineral estate and the number of new and abandoned producing wells on federal mineral estate. These numbers would be compared to the planning area RFD and to the level of oil and gas development identified in the proposed alternative.

In addition, the BLM would estimate oil and gas emissions from federal mineral estate every three years for oil and gas wells drilled and producing after the ROD is signed. Emission estimates will be based on well types, well numbers, and knowledge of typical equipment and operations. Emission estimation methods are expected to improve over time as better data become available. The emission estimates would also account for implemented mitigation measures and for new emission control regulations as they become effective. The BLM would collect additional data related to oil and gas equipment and operations to improve emission inventory quality. One area identified for improvement involves acquiring better data on oil and gas equipment used in the planning area. In order to improve fugitive dust emission estimates, the number, type, and length of vehicle trips in high-activity areas would also be assessed.

Each three-year oil and gas emission inventory would be compared to emission estimates for the RFD and the proposed alternative.

## **3.0 Ambient Air Quality Monitoring Support**

The Air Quality Program of the SD DENR has primary responsibility for siting and operating ambient air quality monitors within South Dakota and for reporting monitoring data to USEPA and to the public. As described in its annual Ambient Air Monitoring Annual Network Plan (SD DENR 2012), the SD DENR identifies monitoring objectives for assessing ambient concentrations of criteria air pollutants and assessing compliance with the NAAQS.

Monitors that are located within the planning area and are representative of rural areas near oil and gas activity are listed in Table 1. These monitors would be used by the BLM when developing annual air quality assessments. If additional SD DENR monitoring stations are installed and operated for the purpose of assessing air quality impacts from oil and gas activity, data from these monitors would be used for ambient air quality assessments under this plan.

<b>Table 1. Representative Air Quality Monitoring Stations Within the Planning Area</b>					
<i>Station Name</i>	<i>Pollutants Monitored by SLAMS</i>	<i>Station Number</i>	<i>County</i>	<i>Latitude</i>	<i>Longitude</i>
Badlands	NO <sub>2</sub> , O <sub>3</sub> , PM <sub>10</sub> , PM <sub>2.5</sub> , SO <sub>2</sub>	46-071-0001	Jackson	N 4,847,799.95	E 263,173.81
Wind Cave	O <sub>3</sub> , PM <sub>10</sub> , PM <sub>2.5</sub>	46-033-0132	Custer	N 4,823,856.93	E 622,471.56

Latitude and longitude are provided in UTM coordinates based on Zone 13, NAD 83.

## 4.0 Air Quality and AQRV Assessment

The BLM would assess air quality and AQRVs on an annual basis using quality-assured data from the USEPA, SD DENR, USFS, USFWS, NPS, and other sources. In addition, a preliminary assessment of ozone concentrations would be performed on a weekly basis using data provided by the SD DENR.

### 4.1 Annual NAAQS Assessment

Based on the monitors listed in Section 3.0, the BLM would assess air quality monitoring data annually and would share the results of the assessment with the SD DENR and AQTW. The purposes of the annual assessment are to compare monitored data to NAAQS and to identify seasonal and long-term trends in air pollutant concentrations. The BLM would complete the annual assessment by May 31 of each year in order to ensure that quality-assured data are available for review.

NAAQS are provided in Table 2 for pollutants monitored within the planning area. As of December 1, 2012, CO and lead were not monitored within the planning area. The standards shown in Table 2 would be revised to reflect future regulatory changes.

<b>Table 2. NAAQS for Pollutants Monitored in the Planning Area</b>				
<i>Pollutant</i>	<i>Averaging Period</i>	<i>Concentration</i>	<i>Standard Type</i>	<i>Form of NAAQS<sup>1</sup> Primary Standard</i>
NO <sub>2</sub>	1-hour	100 ppb	Primary	3-year average of the 98 <sup>th</sup> percentile concentrations
	Annual	53 ppb	Primary, Secondary	Annual mean
Ozone	8-hour	0.075 ppm	Primary, Secondary	3-year average of the fourth highest daily maximum 8-hour average
PM <sub>2.5</sub>	24-hour	35 µg/m <sup>3</sup>	Primary, Secondary <sup>3</sup>	3-year average of the 98 <sup>th</sup> percentile concentrations
	Annual	12.0 µg/m <sup>3</sup> <sup>2</sup> 15.0 µg/m <sup>3</sup>	Primary, Secondary	3-year average annual mean
PM <sub>10</sub>	24-hour	150 µg/m <sup>3</sup>	Primary, Secondary	NTBE more than one per year on average over 3 years
SO <sub>2</sub>	1-hour	75 ppb	Primary	3-year average of the 99 <sup>th</sup> percentile concentrations
	3-hour	0.5 ppm	Secondary	Annual 2nd highest maximum of 3-hour block averages

µg/m<sup>3</sup> micrograms per cubic meter  
 NAAQS National Ambient Air Quality Standards  
 NO<sub>2</sub> nitrogen dioxide  
 NTBE not to be exceeded  
 PM<sub>2.5</sub> particulate matter less than or equal to 2.5 microns  
 PM<sub>10</sub> particulate matter less than or equal to 10 microns  
 ppb parts per billion  
 ppm parts per million  
 SO<sub>2</sub> sulfur dioxide

<sup>1</sup> NAAQS are codified in Title 40 of the Code of Federal Regulations (CFR), Part 50.  
<sup>2</sup> Effective March 18, 2013, the primary annual PM<sub>2.5</sub> standard was revised from 15.0 µg/m<sup>3</sup> to 12.0 µg/m<sup>3</sup>.  
<sup>3</sup> The secondary annual PM<sub>2.5</sub> standard remains at 15.0 µg/m<sup>3</sup>.

The BLM would use design values to compare ambient monitoring data to the NAAQS. Design values reflect the form of the NAAQS; they define the statistical metric used to compare monitoring data to federal and state standards. Depending on the pollutant and averaging time being assessed, the NAAQS is typically stated in terms of the maximum or second maximum concentration, average concentration, or a percentile of the standard. The form of a standard also states whether the design value is determined based on one or more years of monitoring data. USEPA-calculated design values serve a critically important regulatory purpose; they determine whether areas are designated attainment or nonattainment. As such, USEPA's design value determinations may take more than one year to finalize.

In order to review air quality trends more quickly, the BLM would determine "mitigation design values" by May 31 of each year for the previous calendar year(s). The mitigation design value would be a metric calculated by the BLM that uses procedures similar to USEPA's regulatory design value calculation methodology, with the advantage that the BLM-calculated mitigation design values can be determined more quickly. The timing allows the SD DENR adequate time to quality assure monitoring data. However, the SD DENR may not yet have USEPA concurrence on data that has been flagged by the SD DENR due to exceptional events, such as wildfires. Consequently, the BLM-calculated mitigation design values would exclude monitoring data associated with SD DENR-identified exceptional events. Each BLM annual assessment would look back the requisite number of years for each pollutant and include data from the time period prior to ROD issuance for the first several annual BLM assessments. Additional information concerning design value calculations is provided in Section 6.2.3. The BLM will work closely with the SD DENR to ensure that only data certified by the SD DENR and procedures consistent with MDEQ procedures are used in design value calculations.

## **4.2 Preliminary Ozone Assessment**

BLM would perform weekly preliminary ozone concentration reviews to determine if high ozone events occur at the monitors identified in Section 3.0. If a high-ozone event occurs, the BLM would document meteorological and other conditions that may have contributed to the event. Because high-ozone events in other rural parts of the nation are not well understood and contributing factors can be site-specific, the BLM would gather data to develop baseline information relevant to any high-ozone events that may occur within the planning area. Relevant baseline information includes capturing meteorological data for each event, determining the amount of snow on the ground (if applicable), and identifying any other data that may help describe circumstances associated with the event. For the purposes of this effort, a high-ozone event would be defined as a day for which the maximum 8-hour average ozone concentration is at or above 0.065 ppm.

In order to quickly ascertain relevant circumstances, the preliminary ozone assessments would use non-quality-assured data provided by the SD DENR. As part of the annual NAAQS assessment, quality-assured ozone data would be reviewed to determine if the preliminary ozone monitoring data were valid or if monitored high ozone concentrations were due to monitor malfunctions.

If high-ozone events occur within the planning area, a summary of events and a discussion of relevant meteorological data and circumstances would be developed as part of the annual NAAQS assessment. These summaries and the underlying data may provide important information that can be used to predict potential occurrences of high-ozone events and to identify mitigation measures and/or proactive measures that could prevent future events.

## **4.3 Annual AQRV Assessment**

Federal land managers track the status, condition, and trends of AQRVs for Class I and sensitive Class II areas under their jurisdictions. Consequently, the BLM would request visibility, sulfur and nitrogen deposition, and lake acid neutralizing capacity data from the USFS, USFWS, and NPS and would include agency-submitted data in the BLM's annual review of AQRV trends. The annual review would also include AQRV data from any Class I or sensitive Class II areas under BLM jurisdiction.

Based on these reviews, the BLM would maintain an awareness of AQRV trends. However, it should be noted that the reviews would not necessarily link AQRV trends to oil and gas development within the planning area. AQRV impacts are often associated with pollutants that can be transported long distances from many different types of sources. For example, sources outside South Dakota play a major role in visibility degradation at Wind Cave National Park and at Badlands National Park, as described in the South Dakota's Regional Haze State Implementation Plan (SD DENR 2011).

## 5.0 Future Modeling

The BLM committed to perform PGM in order to assess regional air quality and AQRV impacts. Due to insufficient monitoring and regional emissions data available during development of the RMP, PGM will not be completed prior to issuance of the RMP/EIS and the ROD. In order to complete PGM expeditiously, the BLM began data acquisition and initiated steps needed to proceed with PGM. When PGM is completed and the results assessed, the BLM may identify additional emission mitigation measures for oil and gas activity.

### 5.1 Photochemical Grid Modeling

Comprehensive regional air quality and AQRV regional modeling of emission sources within the planning area and surrounding areas requires PGM. This type of modeling can predict ozone and regional haze impacts, for which major pollutants and precursors can be transported many hundreds of miles.

#### 5.1.1 Data Acquisition

PGM requires three main types of concurrent data: meteorological data, ambient monitoring data, and comprehensive emission data. BLM's analysis determined that the latter two types of data need to be augmented and updated prior to performing PGM.

#### *Additional Monitoring*

Ambient monitoring data throughout the PGM domain is needed in order to validate model performance, which is assessed by modeling a previous year and comparing the model's predicted concentrations to actual monitored concentrations. New monitors in northern and central Montana near the towns of Malta and Lewistown will provide much-needed data to assess model performance in areas with oil and gas activity northwest of the planning area.

#### *Updating Emission Inventories*

Comprehensive emission inventories are also critically important in predicting cumulative air quality and AQRV impacts. Current oil and gas regional emission inventories for South Dakota are known to lack important emission sources, particularly sources of volatile organic compounds (VOCs), which contribute to ozone formation. The existing regional oil and gas inventory for the Williston Basin represents the year 2002 and was developed as part of the Western Regional Air Partnership (WRAP) Phase II inventory. Since then, 2006 Phase III emission inventories have been developed for oil and gas basins within Colorado, Utah, Wyoming, and New Mexico, but have not yet been completed for Montana, North Dakota, and South Dakota. The Phase III inventories have more comprehensive emission inventories of VOC sources at oil and gas facilities.

The BLM Montana and Dakotas State Office is providing financial assistance to the WRAP so that Phase III oil and gas emission inventories can be completed in early 2014 for the Williston Basin and the Great Plains Basin. These inventories would represent calendar year 2011 emissions. In addition to covering the planning area, the inventories would include comprehensive recent emission estimates for oil and gas activity in North Dakota and Montana.

#### 5.1.2 PGM Schedule

In order to use a full 12 months of ambient monitoring data from the new monitors in northern and central Montana, the baseline year for PGM is expected to be 2013 or may be a 12-month period beginning in late 2012 and ending in 2013. PGM planning began in 2012 and development of the PGM modeling protocol was completed during 2013, with modeling occurring primarily in 2014 and early 2015. Review and assessment of PGM results would be completed in Fall 2015. Table 3 provides the data acquisition and PGM schedule.

The Weather Research and Forecasting (WRF) model would be used to model meteorological conditions and the Comprehensive Air Quality Model with Extensions (CAMx) model would be used for photochemical grid modeling. In addition, multiple models would be used to develop and process emission inventories for input into the photochemical grid model. When modeling is completed, an Air Resource Technical Support Document (ARTSD) would be developed.

Initial PGM would include future year modeling for a year between 2017 and 2030 using emissions representing full



development of BLM oil and gas resources under the selected Alternative. The specific year would be determined by the BLM based on the ability to predict future cumulative regional oil and gas emissions in the Williston and Great Plains Basins. After initial PGM is completed, the BLM would begin an assessment process to determine when or if additional PGM may be needed. Factors to be considered in determining when additional PGM would be needed include the adequacy of the adaptive management strategy to maintain good air quality, and the level of BLM-authorized oil and gas activity and emissions compared to modeled levels.

<b>Table 3. Data Acquisition and PGM Schedule</b>	
<i>Task / Subtask</i>	<i>Completion Date</i>
<b>Pre-Modeling Emission Inventory *</b>	
Williston and Great Plains Basin Inventory	3/31/2014
<b>Base Year Modeling and Evaluation *</b>	
WRF Modeling	5/8/2014
Draft WRF Model Evaluation	6/5/2014
AQTW and SD DENR WRF Evaluation Review	7/10/2014
Emission Modeling (Base and Future Year) & Report	9/9/2014 (base year) 12/11/2014 (future year)
AQTW and SD DENR Emission Modeling Review	10/2/2014 (base year) 1/7/2015 (future year)
Base Year Photochemical Grid Modeling	8/28/2014
Draft Base Year PGM Evaluation	11/17/2014
AQTW and SD DENR PGM Evaluation Review	12/1/2014
Finalize WRF and PGM Evaluations	12/15/2014
Emission Modeling Reports	1/21/2015
<b>Future Year Modeling and Evaluation *</b>	
Future Year Photochemical Grid Modeling	3/8/2015
Analyze Air Quality and AQRV Impacts	3/29/2015
Draft ARTSD	4/19/2015
AQTW and SD DENR ARTSD Review	6/19/2015
Finalize ARTSD	7/1/2015

\* Dates are estimated and subject to revision.

AQTW = Air Quality Technical Workgroup

ARTSD = Air Resource Technical Support Document

SD DENR = South Dakota Department of Environment & Natural Resources

PGM = Photochemical grid modeling

RFP = Request for Proposal

WRF = Weather Research and Forecasting Model

### 5.1.3 SD DENR and AQTW Review and Input to PGM

Throughout the PGM data collection and modeling process, the BLM would work collaboratively with the SD DENR AQTW, and with and other agencies or Tribes that request to be involved in the PGM effort. These collaborators provided technical review and comment on the modeling protocol, and will provide input on the WRF and PGM performance evaluations, and on the draft ARTSD. Substantial time has been included in the schedule shown in Table 3 to allow adequate review and comment periods during the PGM process.

### 5.1.4 Availability of PGM Results

Future PGM results would be presented in the final ARTSD and in a summary of the results. The ARTSD and summary document would be posted on the SDFO website. In addition, the WRF and PGM protocol document would be provided

via the website when the photochemical modeling ARTSD is made available. Outreach information regarding the availability of the results would be made through the AQTW and agencies involved in the PGM process, as well as other interested parties.

## 5.2 Post-PGM Modeling

To the extent that future emission increases are within the levels modeled with PGM or other modeling and are proximate to modeled emission locations, far-field air quality and AQRV impact analysis may incorporate by reference PGM and other modeling results. The BLM and the AQTW would determine whether previous modeling is sufficient to satisfy MOU requirements. This air quality management approach is consistent with the Air Quality Oil and Gas MOU (USDI 2011) and allows for efficient air quality and AQRV impact analysis.

If additional modeling is performed after PGM is complete, an assessment of air quality and AQRV impacts would be made and, if necessary, additional mitigation measures may be identified.

## 6.0 Mitigation

Air quality and AQRV impact mitigation would involve two types of mitigation: 1) initial mitigation measures that become effective when the ROD is signed, and 2) enhanced mitigation measures that may be identified based on future ambient monitoring data or modeling results.

### 6.1 Initial Mitigation Actions

The following air quality mitigation measures would be applied upon issuance of the ROD through leasing documents and project-specific NEPA documents. To the extent practical, emission reductions associated with these mitigation measures have been included in the RMP/EIS emission inventory.

1. Design and construct roads and well pads to reduce the amount of fugitive dust generated by traffic or other activities. During construction activities, apply water, apply dust-suppression chemicals, apply gravel, or use other control methods to achieve 50 percent fugitive dust control efficiency, except when ground is wet or frozen.
2. Use water or other BLM-approved dust suppression during drilling, completion, and well workover operations for dust abatement on access roads, as needed, to achieve a 50 percent fugitive dust control efficiency, except when ground is wet or frozen.
3. Use water or other BLM-approved dust suppression in high traffic areas during production operations for dust abatement, as needed, to achieve 50 percent fugitive dust control efficiency, except when ground is wet or frozen. Operators will work with local government agencies to improve dust suppression on roads.
4. For oil and gas Project Plans of Development (PODs), oil and gas operators will establish speed limits for project-required unpaved roads in and adjacent to the project area; oil and gas operator employees will comply with these speed limits.
5. For oil and gas Project PODs, oil and gas operators will be encouraged to reduce surface disturbance, vehicle traffic, and fugitive dust emissions by consolidating facilities (e.g., using multi-well pads, storage vessels) when feasible.
6. Diesel drill rig and completion engines greater than 200 hp will meet Tier 4 emission standards for non-road diesel engines. Alternatively, oil and gas operators may use drill rig and completion engines that exceed Tier 4 emission standards if modeling or monitoring at the project level or programmatic level demonstrates compliance with the NAAQS and protection of AQRVs.
7. For hydraulically fractured gas wells that do not qualify as “low pressure wells”, “wildcat,” or “delineation” wells, oil and gas operators will comply with reduced emissions completion (REC) requirements specified in Subpart OOOO, Standards of Performance for Crude Oil and Natural Gas Production, Transmission and Distribution (40 CFR §60.5375) within six months of ROD issuance.

8. Non-road diesel engines will be required to use ultra-low sulfur diesel fuel (15 ppmw) as required by 40 CFR §80.610(e)(3)(iii).

## 6.2 Monitoring-Based Mitigation

Enhanced mitigation would be evaluated and implemented if ambient monitoring data at monitors located in oil and gas activity areas within the planning area indicate that pollutant concentrations are approaching or threatening the NAAQS. If additional SD DENR monitoring stations are placed in oil and gas activity areas for the purpose of assessing air quality impacts from oil and gas activity, data from these stations would be included in ambient air quality assessments used to determine whether enhanced mitigation is needed.

Prior to completion of initial PGM, monitoring-based thresholds would be based on evaluation of exceedances of the NAAQS, as described in Section 6.2.1. After completion of initial PGM, monitoring-based thresholds would be based on BLM-calculated design values, as described in Section 6.2.3.

### 6.2.1 Monitoring-Based Thresholds before PGM Completion

Based on requests from USEPA during the MOU review process, the BLM would review NAAQS exceedances and determine if enhanced mitigation would be warranted during the interim period between ROD issuance and PGM completion. The BLM would require enhanced mitigation for BLM-authorized oil and gas activities if there is a monitored exceedance of the NAAQS at a monitor listed in Section 3.0, unless the BLM determines that enhanced mitigation is not warranted after completing specified steps as outlined below.

1. The BLM would notify the USEPA and SD DENR within 30 days after monitoring data showing an exceedance has been posted on USEPA's Air Quality System (AQS). The notification would state that the BLM is reviewing the exceedance according to this procedure.
2. After consulting with the SD DENR, the BLM would determine whether an exceptional event<sup>1</sup> may have caused the exceedance.
  - If the SD DENR informs the BLM that an exceptional event likely caused the exceedance, the BLM would provide a letter to that effect to the USEPA. No further action would be necessary.
  - If an exceptional event did not cause the exceedance or if SD DENR would not submit an exceptional event waiver to USEPA, the BLM would perform Step 3.
3. The BLM would conduct a screening level analysis<sup>2</sup> to determine the likely source and location of the exceedance and whether mitigation is needed.<sup>3</sup>
  - If the screening analysis indicates that the exceedance was not caused by BLM-authorized oil and gas source(s) within the planning area or indicates that the BLM-authorized oil and gas source(s) within

<sup>1</sup> The BLM would not formally decide that an exceptional event occurred as this decision would be made by the SD DENR. Until a final determination of an exceptional event is presented to USEPA by the SD DENR, and the USEPA has concurred, the BLM would assume that an exceptional event occurred based on a stated intention by the SD DENR to submit an exceptional event waiver.

<sup>2</sup> Publically available web based applications suggested by the USEPA to identify sources of air pollution and potential impacts include the following sites: trajectory analysis tools like HySplit (<http://ready.arl.noaa.gov/>), air quality data at the USEPA's AQS site (<http://airnow.gov/>), state regulatory agency sites and airnowtech.org, an interactive snow site (<http://www.nohrsc.nws.gov/interactive/html/map.html>), daily ozone modeling (<http://airquality.weather.gov/>), daily ozone and PM<sub>2.5</sub> modeling site (<http://www.getbluesky.org/>), and daily satellite imagery site (<http://ge.ssec.wisc.edu/modis-today/>).

<sup>3</sup> If data necessary to conduct a screening level analysis is not available, the BLM would consult with the SD DENR and the USEPA regarding source attribution and the need for mitigation.

the planning did not contribute to the exceedance, the BLM would convey this finding in writing to the SD DENR and USEPA for review and comment. No further action would be necessary.

- If the screening analysis indicates that the exceedance was caused or contributed to by BLM-authorized oil and gas sources inside the planning area, the BLM would perform Step 4.
- 4. The BLM would consult with the SD DENR and USEPA to determine whether there is a need for: 1) a refined attribution analysis (e.g., attribution test using CAMx ozone source attribution technology or anthropogenic precursor's culpability assessment) or 2) mitigation on BLM-authorized oil and gas emission sources within the planning area. If the refined analysis:
  - Is warranted, BLM would perform the refined analysis within 6 months of completing Step 3 in consultation with SD DENR and USEPA.
  - Indicates that the exceedance was not caused or contributed to by BLM-authorized oil and gas sources inside the planning area, the BLM would provide that recommendation to the SD DENR and USEPA for review and comment. No further action would be necessary.
  - Indicates that the exceedance was caused by BLM-authorized oil and gas sources within the planning area, the BLM would evaluate enhanced mitigation measures, as described in Section 6.2.2.

#### **6.2.2 Determination of Enhanced Mitigation Measures before PGM Completion**

If a NAAQS exceedance occurs prior to completion of PGM and the refined analysis in Step 4 above determined that the exceedance was caused by BLM-authorized oil and gas sources within the planning area, enhanced mitigation measures would be evaluated and selected by the BLM, in cooperation with the SD DENR and the AQTW, when appropriate. Preference would be given to mitigation methods that the SD DENR intends to impose as new regulations or air quality permitting provisions. Selected mitigation measures would be implemented within one year after the BLM decision to apply additional mitigation.

Potential enhanced mitigation measures include the measures listed below based on current information concerning potential emission reduction technologies. Additional measures or equivalent methods or emission restrictions may be identified in the future.

- Drilling and/or blowdown activity restrictions based on meteorological conditions
- Construction activity restrictions based on meteorological conditions
- Centralization of gathering facilities
- Electric drill rigs
- Field electrification for compressors and/or pumpjack engines
- Plunger lift systems with smart automation
- Oil tank load out vapor recovery
- VOC controls on tanks with a potential to emit less than 5 tons per year
- Selective catalytic reduction on non-drill rig stationary engines
- Reduced emission completions beyond those required by USEPA regulations, if determined to be technically and economically feasible
- Well pad density limitations
- Reducing the total number of drill rigs operating simultaneously
- Seasonally reducing or ceasing drilling during specified periods
- Using only lower-emitting drill and completion rig engines during specified time periods
- Using natural gas-fired drill and completion rig engines
- Replacing internal combustion engines with gas turbines for natural gas compression
- Employing a monthly forward looking infrared (FLIR) leak detection program to reduce VOCs
- Tank load out vapor recovery
- Enhanced VOC emission controls with 95% control efficiency on additional production equipment having a potential to emit of greater than 5 tons/year
- Enhanced direct inspection and maintenance program

### **6.2.3 Monitoring-Based Thresholds After PGM Completion**

By May 31 of each year following completion of PGM, the BLM would calculate design values for each pollutant monitored at a federal reference monitor within the planning area and identified as a representative monitor in Section 3.0. The design value would be calculated based on calendar year monitoring data available at the time. Monitoring data from the appropriate prior period would be used. For example, based on PGM completion in summer 2015, the first annual design value calculation would be performed by May 31, 2016 and would include monitoring data for calendar years 2013, 2014, and 2015 for three-year design values and on monitoring data for calendar year 2015 for single-year design values.

Calculation methods would, to the extent possible, follow USEPA procedures provided in the following appendices within Title 40 of the Code of Federal Regulations (CFR), Part 50 in effect as of December 1, 2012. These procedures may be updated by future USEPA regulations and this section of the ARMP would be revised to reflect changing regulations.

- NO<sub>2</sub> (Appendix S)
- O<sub>3</sub> (Appendix P)
- PM<sub>10</sub> (Appendix K)
- PM<sub>2.5</sub> (Appendix N)
- SO<sub>2</sub> (Appendix T)

Design values would be calculated on a site-specific basis (i.e., no spatial averaging of multiple monitors). BLM design value calculations would exclude data associated with exceptional events identified by SD DENR.

### **6.2.4 Determination of Enhanced Mitigation Measures After PGM Completion**

If the air quality assessment described in Section 6.2.3 indicates that a BLM-calculated design value is greater than 85 percent of a NAAQS, one or more enhanced mitigation measures addressing that pollutant or pollutant precursor would be evaluated and selected by the BLM, in cooperation with the SD DENR and USEPA. The geographic extent of the mitigation measure(s) would be determined based on the analysis performed in Section 6.2.3. Potential enhanced mitigation measures include the measures listed above in Section 6.2.2, as well as additional measures that may be identified in the future. Selected mitigation measures would be implemented within 1 year after the BLM decision to apply additional mitigation.

## **6.3 Modeling-Based Mitigation**

### **6.3.1 Modeling-Based Thresholds**

Future modeling would assess air quality and AQRV impacts from future BLM-authorized oil and gas activity and would include regional PGM and project-specific modeling. Modeling-based thresholds for evaluating enhanced mitigation would include potential future impacts on NAAQS or impacts above specific levels of concern for AQRVs in Class I or sensitive Class II areas (as identified on a case-by-case basis by SD DENR or a federal land management or tribal agency).

### **6.3.2 Modeling-Based Enhanced Mitigation Measures**

If BLM-authorized oil and gas activity is predicted to cause or contribute to impacts above the thresholds described above, the BLM would facilitate an interagency process to ensure that a comprehensive strategy is developed to manage air quality impacts from future oil and gas development within the region. The local, state, federal, and Tribal agencies involved in the regulation of air quality and the authorization of oil and gas development would evaluate modeling results from future modeling studies and identify potential air quality concerns and necessary reductions in air emissions. If the modeling predicts significant impacts, these agencies would use their respective authorities to implement enhanced emission control strategies, operating limitations, equipment standards, and/or pacing of development as necessary to ensure continued compliance with applicable ambient air quality standards, including the enhanced mitigation measures listed in Section 6.2.2, other future mitigation measures identified through BLM's adaptive management strategy, or reasonable mitigation measures suggested by the SD DENR or AQTW. If necessary, implementation of mitigation measures would occur within one year of obtaining final modeling results for mitigation measures that conform to currently implemented land use planning decisions and constraints.

## Bibliography

SD DENR 2011. South Dakota's Regional Haze State Implementation Plan. August 18.

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USDI 2011. Memorandum of Understanding Among the U.S. Department of Agriculture, U.S. Department of the Interior, and U.S. Environmental Protection Agency, Regarding Air Quality Analyses and Mitigation for Federal Oil and Gas Decisions Through the National Environmental Policy Act Process. June 23, 2011.

<http://www.epa.gov/oecaerth/resources/policies/nepa/air-quality-analyses-mou-2011.pdf>

## **S-2 South Dakota Field Office Emission Summaries for Alternatives A, B, C, and D**

*Future year emission estimate summaries, by alternative, for the South Dakota Field Office are shown on the following pages.*

**Alternative A**  
**SDFO Future Year Emission Estimate Summary**

<b>Ownership</b>	<b>Emissions (tpy)</b>										
	<b>CO</b>	<b>NO<sub>x</sub></b>	<b>VOC</b>	<b>SO<sub>2</sub></b>	<b>PM<sub>10</sub></b>	<b>PM<sub>2.5</sub></b>	<b>HAPs</b>	<b>CO<sub>2</sub></b>	<b>CH<sub>4</sub></b>	<b>N<sub>2</sub>O</b>	<b>CO<sub>2eq</sub></b>
<b>Federal / BLM</b>											
<i>Oil and Gas Development and Production</i>											
Oil	83.1	36.3	286.0	0.1	10.8	2.6	18.1	8,039	46.3	0.1	9,029
Natural Gas	16.9	6.0	9.7	0.0	1.7	0.4	2.4	2,068	18.6	0.0	2,459
CBNG	2.0	1.0	0.7	0.0	0.6	0.1	0.1	178	5.1	0.0	286
Bentonite Mining	66.0	0.5	0.1	0.1	70.9	11.5	0.0	157	0.0	0.0	157
BLM Travel	0.6	0.0	0.0	0.0	8.9	0.9	0.0	42	0.0	0.0	44
BLM Road Maintenance	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1	0.0	0.0	1
Fire Management <sup>1</sup>	197.6	5.7	11.0	1.5	58.9	20.7	4.0	75	10.1	1.5	744
Forestry Management	2.2	2.9	0.3	0.1	3.0	0.5	0.0	347	0.0	0.0	349
Livestock Grazing	0.2	0.1	0.0	0.0	8.4	0.8	0.0	18	322.4	0.0	6,788
Vegetation Management	0.1	0.0	0.0	0.0	0.6	0.0	0.0	2	0.0	0.0	2
<b>Federal Emission Total</b>	<b>368.7</b>	<b>52.5</b>	<b>307.8</b>	<b>1.7</b>	<b>163.8</b>	<b>37.6</b>	<b>24.7</b>	<b>10,925</b>	<b>402.6</b>	<b>1.6</b>	<b>19,859</b>
<b>Non-Federal</b>											
<i>Oil and Gas Development and Production</i>											
Oil	294.9	246.6	1,146.5	2.3	42.8	15.1	72.6	29,355	182.9	0.1	33,230
Natural Gas	50.2	34.1	37.9	0.3	5.8	2.1	9.5	4,983	66.9	0.0	6,378
CBNG	33.8	22.4	12.0	1.7	4.3	1.3	2.2	2,783	53.2	0.0	3,904
<b>Non-Federal Emission Total</b>	<b>379.0</b>	<b>303.1</b>	<b>1,196.4</b>	<b>4.3</b>	<b>52.9</b>	<b>18.5</b>	<b>84.4</b>	<b>37,121</b>	<b>303.0</b>	<b>0.2</b>	<b>43,512</b>

tpy = short tons per year

<sup>1</sup> Excludes smoke emissions from wildfires, but includes smoke emissions from prescribed fires.



**Comparison to Current Total County Emissions**

<b>Emissions</b>	<b>Emissions (tpy)</b>					
	<b>CO</b>	<b>NO<sub>x</sub></b>	<b>VOC</b>	<b>SO<sub>2</sub></b>	<b>PM<sub>10</sub></b>	<b>PM<sub>2.5</sub></b>
<i>2008 NEI Emissions</i>	<i>46,173</i>	<i>8,485</i>	<i>9,035</i>	<i>132</i>	<i>15,327</i>	<i>2,319</i>
<i>Alt. A O&amp;G (%) of NEI Emissions</i>	<i>0.2%</i>	<i>0.5%</i>	<i>3.3%</i>	<i>0.1%</i>	<i>0.1%</i>	<i>0.1%</i>
<i>Alt. A (%) of NEI Emissions</i>	<i>0.8%</i>	<i>0.6%</i>	<i>3.4%</i>	<i>1.3%</i>	<i>1.1%</i>	<i>1.6%</i>

*County Emissions (Butte, Custer, Fall River, Haakon, Harding, Lawrence, Meade, Pennington, Perkins, and Stanley counties).*

*Source: USEPA 2008 National Emission Inventory (NEI), <http://neibrowser.epa.gov/eis-public-web/geo/county-emissions.html?stateJurisdictionId=43&inventoryYear=2008>, accessed December 12, 2011.*

**Alternative B**  
**SDFO Future Year Emission Estimate Summary**

<b>Ownership</b>	<b>Emissions (tpy)</b>										
	<b>CO</b>	<b>NO<sub>x</sub></b>	<b>VOC</b>	<b>SO<sub>2</sub></b>	<b>PM<sub>10</sub></b>	<b>PM<sub>2.5</sub></b>	<b>HAPs</b>	<b>CO<sub>2</sub></b>	<b>CH<sub>4</sub></b>	<b>N<sub>2</sub>O</b>	<b>CO<sub>2eq</sub></b>
<b>Federal / BLM</b>											
<i>Oil and Gas Development and Production</i>											
Oil	67.7	29.6	233.6	0.1	8.7	2.1	14.8	6,520	37.8	0.0	7,327
Natural Gas	15.0	5.2	8.1	0.0	1.7	0.4	2.0	1,912	16.3	0.0	2,255
CBNG	1.5	0.8	0.5	0.0	0.6	0.1	0.1	140	4.5	0.0	236
Bentonite Mining	66.0	0.5	0.1	0.1	70.9	11.5	0.0	157	0.0	0.0	157
BLM Travel	0.6	0.0	0.0	0.0	8.9	0.9	0.0	42	0.0	0.0	44
BLM Road Maintenance	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1	0.0	0.0	1
Fire Management <sup>1</sup>	905.2	25.4	47.1	6.9	130.1	81.7	7.6	75	47.6	6.9	3,215
Forestry Management	2.2	2.9	0.3	0.1	3.3	0.5	0.0	347	0.0	0.0	349
Livestock Grazing	0.2	0.1	0.0	0.0	8.7	0.9	0.0	18	339.5	0.0	7,148
Vegetation Management	0.1	0.0	0.0	0.0	0.6	0.0	0.0	2	0.0	0.0	2
<b>Federal Emission Total</b>	<b>992.5</b>	<b>64.4</b>	<b>289.8</b>	<b>7.1</b>	<b>233.5</b>	<b>98.1</b>	<b>24.5</b>	<b>9,213</b>	<b>445.8</b>	<b>7.0</b>	<b>20,734</b>
<b>Non-Federal</b>											
<i>Oil and Gas Development and Production</i>											
Oil	294.9	246.6	1,146.5	2.3	42.8	15.1	72.6	29,355	182.9	0.1	33,230
Natural Gas	50.2	34.1	37.9	0.3	5.8	2.1	9.5	4,983	66.9	0.0	6,378
CBNG	33.8	22.4	12.0	1.7	4.3	1.3	2.2	2,783	53.2	0.0	3,904
<b>Non-Federal Emission Total</b>	<b>379.0</b>	<b>303.1</b>	<b>1,196.4</b>	<b>4.3</b>	<b>52.9</b>	<b>18.5</b>	<b>84.4</b>	<b>37,121</b>	<b>303.0</b>	<b>0.2</b>	<b>43,512</b>

tpy = short tons per year

<sup>1</sup> Excludes smoke emissions from wildfires, but includes smoke emissions from prescribed fires.

**Comparison to Current Total County Emissions**

<b>Emissions</b>	<b>Emissions (tpy)</b>					
	<b>CO</b>	<b>NO<sub>x</sub></b>	<b>VOC</b>	<b>SO<sub>2</sub></b>	<b>PM<sub>10</sub></b>	<b>PM<sub>2.5</sub></b>
2008 NEI Emissions	46,173	8,485	9,035	132	15,327	2,319
Alt. B O&G (%) of NEI Emissions	0.2%	0.4%	2.7%	0.1%	0.1%	0.1%
Alt. B (%) of NEI Emissions	2.1%	0.8%	3.2%	5.4%	1.5%	4.2%

County Emissions (Butte, Custer, Fall River, Haakon, Harding, Lawrence, Meade, Pennington, Perkins, and Stanley counties).

Source: USEPA 2008 National Emission Inventory (NEI), <http://neibrowser.epa.gov/eis-public-web/geo/county-emissions.html?stateJurisdictionId=43&inventoryYear=2008>, accessed December 12, 2011.

**Comparison to Other Alternatives**

<b>Emissions</b>	<b>Emissions (tpy)</b>										
	<b>CO</b>	<b>NO<sub>x</sub></b>	<b>VOC</b>	<b>SO<sub>2</sub></b>	<b>PM<sub>10</sub></b>	<b>PM<sub>2.5</sub></b>	<b>HAPs</b>	<b>CO<sub>2</sub></b>	<b>CH<sub>4</sub></b>	<b>N<sub>2</sub>O</b>	<b>CO<sub>2eq</sub></b>
Alt. B - Alt. A	624	12	-18	5	70	60	0	-1,712	43	5	875
Alt B % Increase Over Alt A	169%	23%	-6%	318%	43%	161%	-1%	-16%	11%	347%	4%

**Alternative C**  
**SDFO Future Year Emission Estimate Summary**

<b>Ownership</b>	<b>Emissions (tpy)</b>										
	<b>CO</b>	<b>NO<sub>x</sub></b>	<b>VOC</b>	<b>SO<sub>2</sub></b>	<b>PM<sub>10</sub></b>	<b>PM<sub>2.5</sub></b>	<b>HAPs</b>	<b>CO<sub>2</sub></b>	<b>CH<sub>4</sub></b>	<b>N<sub>2</sub>O</b>	<b>CO<sub>2eq</sub></b>
<b>Federal / BLM</b>											
<i>Oil and Gas Development and Production</i>											
Oil	49.3	21.5	169.2	0.0	6.4	1.5	10.7	4,779	27.4	0.0	5,365
Natural Gas	9.4	3.4	5.6	0.0	0.9	0.2	1.4	1,112	10.5	0.0	1,332
CBNG	1.5	0.8	0.5	0.0	0.6	0.1	0.1	140	4.5	0.0	236
Bentonite Mining	66.0	0.5	0.1	0.1	70.9	11.5	0.0	157	0.0	0.0	157
BLM Travel	0.6	0.0	0.0	0.0	8.9	0.9	0.0	42	0.0	0.0	44
BLM Road Maintenance	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1	0.0	0.0	1
Fire Management <sup>1</sup>	455.6	12.9	24.2	3.4	84.9	43.0	5.3	75	23.8	3.5	1,645
Forestry Management	2.2	2.9	0.3	0.1	3.0	0.5	0.0	347	0.0	0.0	349
Livestock Grazing	0.2	0.1	0.0	0.0	8.4	0.8	0.0	18	322.4	0.0	6,788
Vegetation Management	0.1	0.0	0.0	0.0	0.6	0.0	0.0	2	0.0	0.0	2
<b>Federal Emission Total</b>	<b>584.9</b>	<b>42.1</b>	<b>200.0</b>	<b>3.6</b>	<b>184.6</b>	<b>58.6</b>	<b>17.5</b>	<b>6,672</b>	<b>388.7</b>	<b>3.5</b>	<b>15,919</b>
<b>Non-Federal</b>											
<i>Oil and Gas Development and Production</i>											
Oil	294.9	246.6	1,146.5	2.3	42.8	15.1	72.6	29,355	182.9	0.1	33,230
Natural Gas	50.2	37.8	37.9	0.3	5.8	2.1	9.5	4,983	66.9	0.0	6,378
CBNG	33.8	22.4	12.0	1.7	4.3	1.3	2.2	2,783	53.2	0.0	3,904
<b>Non-Federal Emission Total</b>	<b>379.0</b>	<b>306.9</b>	<b>1,196.4</b>	<b>4.3</b>	<b>52.9</b>	<b>18.5</b>	<b>84.4</b>	<b>37,121</b>	<b>303.0</b>	<b>0.2</b>	<b>43,512</b>

tpy = short tons per year

<sup>1</sup> Excludes smoke emissions from wildfires, but includes smoke emissions from prescribed fires.

**Comparison to Current Total County Emissions**

<b>Emissions</b>	<b>Emissions (tpy)</b>					
	<b>CO</b>	<b>NO<sub>x</sub></b>	<b>VOC</b>	<b>SO<sub>2</sub></b>	<b>PM<sub>10</sub></b>	<b>PM<sub>2.5</sub></b>
2008 NEI Emissions	46,173	8,485	9,035	132	15,327	2,319
Alt. O&G (%) of NEI Emissions	0.1%	0.3%	1.9%	0.0%	0.0%	0.1%
Alt. C (%) of NEI Emissions	1.3%	0.5%	2.2%	2.8%	1.2%	2.5%

County Emissions (Butte, Custer, Fall River, Haakon, Harding, Lawrence, Meade, Pennington, Perkins, and Stanley counties).

Source: USEPA 2008 National Emission Inventory (NEI), <http://neibrowser.epa.gov/eis-public-web/geo/county-emissions.html?stateJurisdictionId=43&inventoryYear=2008>, accessed December 12, 2011.

**Comparison to Other Alternatives**

<b>Emissions</b>	<b>Emissions (tpy)</b>										
	<b>CO</b>	<b>NO<sub>x</sub></b>	<b>VOC</b>	<b>SO<sub>2</sub></b>	<b>PM<sub>10</sub></b>	<b>PM<sub>2.5</sub></b>	<b>HAPs</b>	<b>CO<sub>2</sub></b>	<b>CH<sub>4</sub></b>	<b>N<sub>2</sub>O</b>	<b>CO<sub>2eq</sub></b>
Alt. C - Alt. A	216	-10	-108	2	21	21	-7	-4,253	-14	2	-3,940
Alt. C - Alt. B	-408	-22	-90	-3	-49	-40	-7	-2,541	-57	-3	-4,815
Alt C % Increase Over Alt A	59%	-20%	-35%	114%	13%	56%	-29%	-39%	-3%	125%	-20%
Alt C% Increase Over Alt B	-41%	-35%	-31%	-49%	-21%	-40%	-28%	-28%	-13%	-50%	-23%

**Alternative D**  
**SDFO Future Year Emission Estimate Summary**

Ownership	Emissions (tpy)										
	CO	NO <sub>x</sub>	VOC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	HAPs	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>
<b>Federal / BLM</b>											
<i>Oil and Gas Development and Production</i>											
Oil	55.0	23.5	181.7	0.1	7.8	1.8	11.5	5,561	29.8	0.0	6,198
Natural Gas	12.7	4.1	6.2	0.0	1.6	0.4	1.5	1,717	13.3	0.0	2,000
CBNG	1.5	0.8	0.5	0.0	0.6	0.1	0.1	140	4.5	0.0	236
Bentonite Mining	66.0	0.5	0.1	0.1	70.9	11.5	0.0	157	0.0	0.0	157
BLM Travel	0.6	0.0	0.0	0.0	8.9	0.9	0.0	42	0.0	0.0	44
BLM Road Maintenance	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1	0.0	0.0	1
Fire Management <sup>1</sup>	905.2	25.4	47.1	6.9	130.1	81.7	7.6	75	47.6	6.9	3,215
Forestry Management	2.2	2.9	0.3	0.1	3.3	0.5	0.0	347	0.0	0.0	349
Livestock Grazing	0.2	0.1	0.0	0.0	8.7	0.9	0.0	18	339.5	0.0	7,148
Vegetation Management	0.1	0.0	0.0	0.0	0.6	0.0	0.0	2	0.0	0.0	2
<b>Federal Emission Total</b>	<b>1,043.5</b>	<b>57.2</b>	<b>236.0</b>	<b>7.1</b>	<b>232.5</b>	<b>97.7</b>	<b>20.8</b>	<b>8,059</b>	<b>434.8</b>	<b>7.0</b>	<b>19,350</b>
<b>Non-Federal</b>											
<i>Oil and Gas Development and Production</i>											
Oil	294.9	246.6	1,146.5	2.3	42.8	15.1	72.6	29,355	182.9	0.1	33,230
Natural Gas	50.2	34.1	37.9	0.3	5.8	2.1	9.5	4,983	66.9	0.0	6,378
CBNG	33.8	22.4	12.0	1.7	4.3	1.3	2.2	2,783	53.2	0.0	3,904
<b>Non-Federal Emission Total</b>	<b>379.0</b>	<b>303.1</b>	<b>1,196.4</b>	<b>4.3</b>	<b>52.9</b>	<b>18.5</b>	<b>84.4</b>	<b>37,121</b>	<b>303.0</b>	<b>0.2</b>	<b>43,512</b>

tpy = short tons per year

<sup>1</sup> Excludes smoke emissions from wildfires, but includes smoke emissions from prescribed fires.

**Comparison to Current Total County Emissions**

<b>Emissions</b>	<b>Emissions (tpy)</b>					
	<b>CO</b>	<b>NO<sub>x</sub></b>	<b>VOC</b>	<b>SO<sub>2</sub></b>	<b>PM<sub>10</sub></b>	<b>PM<sub>2.5</sub></b>
<i>2008 NEI Emissions</i>	46,173	8,485	9,035	132	15,327	2,319
<i>Alt. D O&amp;G (%) of NEI Emissions</i>	0.1%	0.3%	2.1%	0.1%	0.1%	0.1%
<i>Alt. D (%) of NEI Emissions</i>	2.3%	0.7%	2.6%	5.4%	1.5%	4.2%

County Emissions (Butte, Custer, Fall River, Haakon, Harding, Lawrence, Meade, Pennington, Perkins, and Stanley counties).

Source: USEPA 2008 National Emission Inventory (NEI), <http://neibrowser.epa.gov/eis-public-web/geo/county-emissions.html?stateJurisdictionId=43&inventoryYear=2008>, accessed December 12, 2011.

**Comparison to Other Alternatives**

<b>Emissions</b>	<b>Emissions (tpy)</b>										
	<b>CO</b>	<b>NO<sub>x</sub></b>	<b>VOC</b>	<b>SO<sub>2</sub></b>	<b>PM<sub>10</sub></b>	<b>PM<sub>2.5</sub></b>	<b>HAPs</b>	<b>CO<sub>2</sub></b>	<b>CH<sub>4</sub></b>	<b>N<sub>2</sub>O</b>	<b>CO<sub>2eq</sub></b>
<i>Alt. D - Alt. A</i>	675	5	-72	5	69	60	-4	-2,866	32	5	-510
<i>Alt. D - Alt. B</i>	51	-7	-54	0	-1	0	-4	-1,154	-11	0	-1,384
<i>Alt. D - Alt. C</i>	459	15	36	3	48	39	3	1,387	46	3	3,431
<i>Alt D % Increase Over Alt A</i>	183%	9%	-23%	317%	42%	160%	-16%	-26%	8%	347%	-3%
<i>Alt D % Increase Over Alt B</i>	5%	-11%	-19%	0%	0%	0%	-15%	-13%	-2%	0%	-7%
<i>Alt D % Increase Over Alt C</i>	78%	36%	18%	95%	26%	67%	18%	21%	12%	99%	22%